COLD PACK

FIELD

The present invention relates to a cold pack and more particularly to a cold pack that transfers heat from a human body when the cold pack is placed on or near the human body.

BACKGROUND

A variety of cooling methods are used to treat symptoms such as swelling, inflammation and muscle pain. One known cooling method includes placing ice within a cloth and/or bag and then positioning the ice bag/cloth near an injured portion of the body.

One concern with using ice relates to the rate that heat is transferred from the body because skin damage can result if heat is transferred too quickly from the skin. In addition, as ice melts it loses it capacity to perform cooling. Therefore, ice typically can not be used to perform cooling when an injured patient is located far from refrigeration units where ice needs to be stored to remain frozen.

Another cooling method utilizes a cold pack that generates cooling via an endothermic chemical reaction which takes place within the cold pack. The cold pack typically includes an solute and a liquid that are both stored within a common enclosure. The liquid and solute are initially segregated from one another within the enclosure and then mixed within the enclosure to form an endothermic solution that reduces the temperature of the cold pack.

One concern with such endothermic cold packs is that the solute is in pellet form, which sometimes does not adequately dissolve in to solution when the liquid and endothermic pellets are mixed together within the enclosure. When the pellets dissolve too slowly (or not at all), the endothermic reaction within the solution occurs more slowly and less efficiently than would otherwise be possible if all the endothermic pellets dissolved quickly in the liquid.

Another concern with such endothermic cold packs is that solution which is formed ends up at the bottom (i.e., the lowest point) of the enclosure. The localization of the solution within the enclosure results in temperature differences within the cold pack. The temperature differences that are generated within the cold pack cause the cold pack to cool various sections of an injured area at differing rates.

Accordingly, there is a need for a cold pack that uniformly cools an area of the body. The cold pack should also be readily portable and capable of maintaining a safe skin temperature for an extended period of time when the cold pack is applied on or near the body.

SUMMARY OF THE INVENTION

The present invention relates to a cold pack that is capable of generating an endothermic reaction within the cold pack. The endothermic reaction occurs by mixing an solute with a liquid to form an endothermic solution. The endothermic solution is formed more quickly within the cold pack such that the cold pack rapidly reaches its cooling temperature. In addition, the quickly-formed endothermic solution can be efficiently distributed throughout the cold pack to provide a uniform cooling temperature throughout the entire cold pack.

In one aspect, the present invention relates to a cold pack that includes an enclosure having a powdered solute and a liquid sealed inside the enclosure. The solute and the liquid are segregated within the enclosure by a membrane. Rupturing the membrane mixes the liquid with the powdered solute to produce an endothermic solution within the enclosure. Substantially all of the powdered solute rapidly dissolves within the liquid such that the cold pack quickly reaches its cooling temperature.

In another aspect, the present invention relates to a cold pack that includes an enclosure, and a solute and a liquid sealed within the enclosure. The liquid and the solute are segregated within the enclosure by a membrane. Rupturing the membrane mixes the liquid with the solute to produce an endothermic solution within the enclosure. The cold pack further includes an absorbent core within the enclosure. The absorbent core retains the endothermic solution such that the

absorbent core spreads the endothermic solution throughout the enclosure. Spreading the endothermic solution throughout the enclosure produces a more uniform cooling temperature throughout the cold pack.

In still another aspect, the present invention relates to a cold pack that includes an enclosure. A powdered solute and a liquid are segregated within the enclosure by a membrane. Rupturing the membrane quickly dissolves the powdered solute within the liquid to produce an endothermic solution within the enclosure. An absorbent core is retained within the enclosure to spread the endothermic solution throughout the enclosure. Substantially all of the powdered solute dissolves quickly within the liquid to produce a fast-acting endothermic solution that is spread uniformly throughout the cold pack by the absorbent core.

In yet another aspect, the present invention relates to method of cooling a portion of a body. The method includes segregating a powdered solute from a liquid where both the powdered solute and the liquid are inside of a cold pack. The method further includes mixing the powdered solute with the liquid to form an endothermic solution within the cold pack and applying the cold pack to the portion of the body. As an example, mixing the powdered solute and the liquid to form an endothermic solution may include rupturing a membrane that segregates the powdered solute from the liquid within the cold pack.

In an alternative aspect, the method includes segregating a solute from a liquid where the solute and the liquid are both inside of a cold pack; mixing the solute with the liquid to form an endothermic solution within the cold pack; distributing the endothermic solution throughout the cold pack and applying the cold pack to the portion of the body.

Distributing the endothermic solution throughout the cold pack may include retaining the endothermic solution within an absorbent core. In addition, retaining the endothermic solution within an absorbent core may include retaining the endothermic solution within an absorbent layer.

In another alternative aspect, the method includes segregating a powdered solute from a liquid where the solute and the liquid are both inside of a cold pack, and then mixing the powdered solute with the liquid to form an

endothermic solution within the cold pack. The method further includes distributing the endothermic solution throughout the cold pack and applying the cold pack to the portion of the body.

The purposes and features of the present invention will be set forth in the description that follows. Additional features of the invention will be realized and attained by the product and processes particularly pointed out in the written description and claims hereof, as well as from the appended drawings.

It is to be understood that both the foregoing general description and the following detailed description are exemplary and are intended to provide further explanation of the invention claimed. The accompanying drawings, which are incorporated in and constitute part of this specification, are included to illustrate and provide a further understanding of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood, and further features will become apparent, when reference is made to the following detailed description and the accompanying drawings. The drawings are merely representative and are not intended to limit the scope of the claims. Like parts depicted in the drawings are referred to by the same reference numerals.

Figure 1 illustrates a schematic section view of a cold pack.

Figure 2 illustrates a schematic section view of the cold pack shown in **Figure 1** with a membrane ruptured within the cold pack to produce an endothermic solution within the cold pack.

Figure 3 illustrates a schematic section view of another cold pack.

Figure 4 illustrates a schematic section view of the cold pack shown in **Figure 3** with a membrane ruptured within the cold pack to produce an endothermic solution within the cold pack.

Figure 5 illustrates a schematic section view of yet another cold pack.

Figure 6 illustrates a schematic section view of the cold pack shown in **Figure 5** with a membrane ruptured within the cold pack to produce an endothermic solution within the cold pack

DETAILED DESCRIPTION OF THE INVENTION

In the following detailed description, reference is made to the accompanying drawings, which show specific embodiments in which the invention may be practiced. These embodiments are described in sufficient detail to enable those skilled in the art to practice the invention. It is to be understood that other embodiments may be utilized and structural changes made, such that the following detailed description is not to be taken in a limiting sense.

Figures 1 and 2 illustrate a cold pack 10. The cold pack 10 includes an enclosure 11 with a powdered solute 12 and a liquid 14 sealed inside the enclosure 11. The powdered solute 12 and the liquid 14 are segregated within the enclosure 11 by a membrane 16 (see **Figure 1**). Rupturing the membrane 16, such as by applying pressure to the enclosure 11, mixes the liquid 14 (e.g., water) with the powdered solute 12 to produce an endothermic solution 18 within the enclosure 11 (see **Figure 2**). Substantially all of the powdered solute 12 rapidly dissolves within the liquid 14 such that the cold pack 10 quickly reaches its cooling temperature.

Cold pack 10 may also include an insulation layer 19 that insulates a portion of the enclosure 11 from the surrounding environment. It should be noted that insulation layer 19 may have any size or shape, and may be in, or on, enclosure 11. Insulation layer 19 should be positioned on a side of enclosure 11 that is opposite to the side of enclosure 11 which is to be located on, or near, the body. The insulation layer 19 then serves to reduce warming of the cold pack 10 by the ambient environment without inhibiting heat transfer from the body to the cold pack 10.

Membrane 16 may be polyethylene (among other materials). In addition, any conventional solutes may be used to induce an endothermic reaction within cold pack 10. One example solute includes ammonium nitrate. The pieces that form the powdered solute 12 should be between about 0.001 and 0.025 inches, although it should be noted that smaller pieces may be used and some small minority of pieces may be larger than 0.025 inches.

Figures 3 and 4 illustrate a cold pack 20. The cold pack 20 includes an enclosure 21 and a liquid 24 and solute 22 sealed inside the enclosure 21. The

solute 22 and the liquid 24 (e.g., water) are segregated within the enclosure 21 by a membrane 26.

The cold pack 20 further includes an absorbent core, such as absorbent layer 27, within the enclosure 21 (see **Figure 3**). The absorbent layer 27 retains an endothermic solution 28 that is formed within the enclosure 21 by rupturing the membrane 26 (see **Figure 4**). Once the solute 22 and the liquid 24 are mixed to form the endothermic solution 28, the absorbent layer 27 spreads the endothermic solution 28 throughout the enclosure 21 such that the cold pack 20 uniformly cools an injured portion of a body when the cold pack 20 is positioned on, or near, the body.

The membrane 26 may also isolate the absorbent layer 27 from the solute 22 and/or the liquid 24 until the membrane 26 is ruptured to mix the solute 22 and the liquid 24. In some sample forms, the solute 22 may be interspersed with the absorbent layer 27 before membrane 26 is ruptured. The absorbent core may take forms other than absorbent layer 27 and may be pulp fiber (among other materials).

It should be noted that in the example cold pack 20 illustrated in **Figures 3 and 4**, solute 22 may be in pellet or powder form. In addition, cold pack 20 may include an insulation layer 29 which is similar to insulation layer 19 described above with regard to **Figures 1 and 2**.

Figures 5 and 6 illustrate a cold pack 30. The cold pack 30 includes an enclosure 31. A powdered solute 32 and a liquid 34 are segregated within the enclosure 31 by a membrane 36 (see **Figure 5**). Rupturing the membrane 36 quickly dissolves substantially all of the powdered solute 32 within the liquid 34 to produce an endothermic solution 38 within the enclosure (see **Figure 6**). Quickly dissolving substantially all of the powdered solute 32 within the liquid 34 produces a rapid endothermic reaction within the endothermic solution 38 that quickly drops the temperature of the cold pack 30 to its cooling temperature.

An absorbent core, such as absorbent layer 37, is located within the enclosure 31. The absorbent layer 37 distributes the fast-acting endothermic solution 38 throughout the cold pack 30 such that the cold pack 30 provides uniform and efficient cooling to an injured portion of a body.

The membrane 36 may isolate the absorbent layer 37 from the solute 32 and/or the liquid 34 until the membrane 36 is ruptured to mix the solute 32 and the liquid 34. In some sample forms, the solute 32 may be interspersed with the absorbent layer 37 before membrane 36 is ruptured. In addition, cold pack 30 may include an insulation layer 39 which is similar to insulation layer 19 described above with regard to **Figures 1 and 2.**

In some example embodiments, the solute may be integral with the absorbent layer as opposed to being initially isolated from the absorbent layer. Although not specifically illustrated, these types of example embodiments may include an enclosure and a membrane that initially segregates a liquid from a solute-filled absorbent layer within the enclosure. Combining the solute with the absorbent layer may simplify fabrication of such cold packs.

A method of cooling a portion of a body is described herein with reference to **Figures 1 and 2**. In one form, the method includes segregating a powdered solute 12 from a liquid 14 where the powdered solute 12 and the liquid 14 are inside of a cold pack 10 **(Figure 1)**. The method further includes mixing the powdered solute 12 with the liquid 14 to form an endothermic solution 18 within the cold pack 10 (**Figure 2**), and applying the cold pack 10 to the portion of the body. In some sample forms of the method, mixing the powdered solute 12 and the liquid 14 to form an endothermic solution 18 includes rupturing a membrane 16 that segregates the powdered solute 12 from the liquid 14 within the cold pack 10.

Another form of the method is described herein with reference to **Figures 3-4**. The method includes segregating an solute 22 from a liquid 24 where the solute 22 and the liquid 24 are both inside of a cold pack 20 **(Figure 3)**; mixing the solute 22 with the liquid 24 to form an endothermic solution 28 within the cold pack 22 (**Figure 4**); distributing the endothermic solution 28 throughout the cold pack 20; and applying the cold pack 20 to the portion of the body.

In some sample forms of the method, distributing the endothermic solution 28 throughout the cold pack 20 includes retaining the endothermic solution 28 within an absorbent core, such as absorbent layer 27. In some alternative forms, the method includes mixing the solute 22 and the liquid 24

within the absorbent layer 27. It should also be noted that the solute 22 may be in pellet form or powder form.

Another form of the method is described herein with reference to **Figures 5 and 6**. The method includes segregating a powdered solute 32 from a liquid 34 where the powdered solute 32 and the liquid 34 are in a cold pack 30 (**Figure 5**). The method further includes mixing the powdered solute 32 with the liquid 34 to form an endothermic solution 38 within the cold pack 30 (**Figure 6**) and then distributing the endothermic solution 38 throughout the cold pack 30.

In various embodiments, the method may also include mixing the solute 32 and the liquid 34 within the absorbent layer 37. It should be noted that the method may also include applying the cold pack 30 to the portion of the body.

The size and shapes of the cold packs described herein will depend on the applications where the cold packs will be used (among other factors). In addition, the membranes within the enclosures may have any size, number, arrangement and configuration as long as the membrane (i) segregates the solute from the liquid; and (ii) is capable of being ruptured so that the solute can be mixed with the liquid to form an endothermic solution.

The operations discussed above with respect to the described methods may be performed in a different order from those described herein. It should be noted that attaching a cold pack to a body includes attaching the cold pack directly or indirectly to the body. In addition, FIGS. 1-6 are representational and are not necessarily drawn to scale. Certain proportions thereof may be exaggerated, while others may be minimized.

In alternative forms, a release layer (not shown) may be detachably mounted to the cold pack using an adhesive. The release layer may be removed from the cold pack leaving only the adhesive on the cold pack. The remaining adhesive provides a means for directly or indirectly securing the cold pack to a body, flexible wrap and/or other device.

The cold packs and methods described herein (i) quickly dissolve a powdered solute within the liquid to produce a fast-acting endothermic solution; and/or (ii) uniformly cool an injured portion of a body by distributing the endothermic solution throughout the cold pack.

While the invention has been described in detail with respect to the specific aspects thereof, it will be appreciated that those skilled in the art, upon attaining an understanding of the foregoing, may readily conceive of alterations to, variations of, and equivalents to these aspects which fall within the spirit and scope of the present invention, which should be assessed accordingly to that of the appended claims.